

Advantages of NAVD88 Datum

The Department of Water Resources has been operating a network of water level (tide) stations in the Delta since the early 1950's. All of these stations were established using the National Geodetic Vertical Datum 29 (NGVD29) standard which was the accepted datum at the time. Unfortunately, the problem with the NGVD29 datum is that it established independent mean sea level elevations at 26 base monuments located along the US coastlines. Due to the large distances between these base monuments, it was extremely difficult to try and relate each of these monuments to one another to establish a standard mean sea level for all points in the U.S. This problem adds complications to comparing data sets that are based on different NGVD29 base monuments.

In the 1970's the National Geodetic Survey started using satellites to establish a new datum that would be based on elevation at one base monument. The NGS, in cooperation with professionals in Canada and Mexico, established the North American Vertical Datum (NAVD) 88 standard in the late 1980s. NAVD88 uses one base monument located at Father's Point, Quebec Canada as MSL. All other bench marks in North America are referenced to that one base monument for NAVD88 elevations.

The NAVD88 datum is now the standard datum used by the surveying community. All major data collection agencies that operate in the Delta, including DWR, have converted over to NAVD88 datum. Therefore DWR data can be used with other agency's data without the need for data conversion which can introduce errors. The NGS has also announced that they do not plan to support the NGVD29 datum after 2008.

Station Changes

Central District and the Division of Environmental Services operate about 50 tide and stage stations in the Delta. In 2002, DWR with the assistance of the NGS, conducted a Global Positioning System survey of the Delta and Suisun Marsh to establish new NAVD88 based elevations at over 100 bench marks in the area. At the time this was the largest GPS survey ever conducted in the United States. The field work and subsequent office work to process the data were completed in late 2004. Station conversion was completed at all of the Delta and Suisun Marsh stations this past summer. The following is the procedure used to reset most of these stations:

- Received validated survey data from the Department's Maps and Survey unit identifying the NAVD88 vertical elevation at bench marks that were included in the 2002 GPS survey of the Delta
- Ran levels from the nearest bench mark to the survey marker that was established at each station
- Replaced or re-established the staff gage at each station to reflect the new NAVD88 datum
- Reset all of the instrumentation in the station to reflect the new datum
- Changed the station meta data to reflect the new datum

Table 1 lists the stations that were changed from NGVD29 to NAVD88 datum in the Delta. Included in this table are the latitude and longitude coordinates for each station as well as the conversion factor needed to convert between the two datum.

Data Relationship and Conversion

Prior to summer of 2005, all of our tide stations were set to NGVD29 datum plus three feet. Three feet was added to the collected data to eliminate the possibility of our data loggers recording negative numbers due to tidal fluctuations. Both the staff gage and the data logger reflected this adjusted datum. The upgraded electronic data loggers at all of our stations are now capable of handling negative numbers. Therefore, when we reset the staff gages and data loggers to NAVD88 datum, we eliminated the three foot differential.

Figure 1 shows schematically an example of the differences between NGVD29, NGVD29+3 ft and NAVD88. The actual difference between NGVD29 and NAVD88 is between 2 to 3 feet depending on location in the Delta. In Figure 1, mean sea level as established by NGVD29 (the far left staff) is about 2.5 feet higher than mean sea level for NAVD88 (far right staff). When subtracting out the three foot differential that was added to all of our staff and station data, NAVD88 is about 0.5 feet higher than NGVD29 (comparing the far right staff to the middle staff). In Table 1 the far right column shows the actual correction factors to correct from NGVD29 (+3 ft) to NAVD88 for each station.

Changes to CDEC

The Department operates 35 stations in the Delta that are set up to telemeter data to the California Data Exchange Center (CDEC). These stations are identified in the attached table.

Until September 30, 2006, both NGVD29 and NAVD88 data will be displayed side by side on the CDEC websites under the appropriate header. For these stations that have been affected by the datum change, there will be a preliminary screen prior to the display of the data that will notify the data user of the two sets of data that will be displayed on the CDEC website. A link button to a web page URL address will be located on the preliminary screen for the data user to access that will provide either a cursory or a detailed explanation of the datum change. The detailed explanation will include tables that will identify all of the stations affected as well as the conversion factor to convert from NGVD29 to NAVD88 datum for each station.

A URL button link will also be added on to the screen that displays both NGVD29 and NAV88 data for the station. This button will link back to the cursory and detailed explanation of the datum change.

Public Education and Outreach

The Department realizes the impacts this change in datum may have on flood emergency response, short and long term water resources planning, navigation and operation of existing flood control systems. DWR has developed a plan to notify and inform the public on changes to our data to reduce or eliminate confusion and anxiety. The plan includes:

- Provide presentations during the Pre-Flood Season meetings held in various locations in the Sacramento-San Joaquin Valley,
- Send notifications to federal, State and local agencies alerting them of the datum change with cursory explanations and points of contact for further information,
- Send notification to local businesses that may be affected by the datum change (including marina owners, bait and tackle shops and boat dealerships),
- Alert the media of the datum change,
- Based on the response to our initial education and outreach plan, DWR may conduct follow up workshops to provide detailed and technical explanations to answer questions

DWR will make an assessment of the success of our public outreach and education program in the late summer of 2006 through input from Delta stakeholders. Based on this assessment, DWR will determine if additional public outreach and education steps need to be taken before removing the NGVD29 datum posting on the CDEC website.

To: Distribution List:

This is to notify you that the Department of Water Resources (DWR) has implemented changes related to new elevation datum for the Sacramento-San Joaquin Delta water level information and to describe future data coordination, education and outreach efforts. In addition, the datum change and the areas it will affect are summarized below and in the attached information pages.

Background: On October 1, 2005 DWR converted all of our tide data collection stations in the Delta and Suisun Marsh from being based on the National Geodetic Vertical Datum 29 (NGVD29) standard to the North American Vertical Datum 88 (NAVD88) standard. The NAVD88 datum has been adopted by all of the major data collection agencies and is the accepted standard in the surveying community.

This change has affected the water level readings we are recording at all of our Delta/Suisun Marsh tide stations, including the stations displayed on the California Data Exchange Center (CDEC) website. The CDEC web site will display both the original NGVD29 data and the NAVD88 data until the October 1, 2006. DWR will then evaluate if NGVD29 data should still be displayed on CDEC after October 1, 2006.

Since the data we collect and report in the Delta is widely used by water resources managers, water users, and emergency responders, changing the datum at these stations needs to be well coordinated. DWR established the following plan of action to inform and educate the public on the affects of this datum change:

- Provide presentations during the Pre-Flood Season meetings held in various locations in the Sacramento-San Joaquin Valley,
- Send notifications to federal, State and local agencies alerting them of the datum change with explanations and points of contact for further information,
- Send notification to local businesses that may be affected by the datum change (including marina owners, bait and tackle shops and boat dealerships),
- Alert the media of the datum change,
- Conduct workshops for stakeholders to provide detailed and technical explanations and an opportunity to answer questions if needed.

Distribution List

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DWR began implementation of this plan of action in the fall of 2005 during the series of pre-flood season meetings held in October and early November. This datum change is significant enough to require coordination with our stakeholders to insure that all water operations as well as flood emergency procedures are adjusted to conform to this new datum standard. For more detailed information on this datum change, please access the following URL site: http://www.cd.water.ca.gov/surface_water/surface_water.cfm.

If you have any questions about the datum change or our public education and outreach program, please contact Bob Nozuka at (916) 227-7597.

Sincerely,

Rod Mayer, Acting Chief
Flood Management

Mark W. Cowin, Chief
Planning and Local Assistance

Attachments

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Spell checked March 9, 2006

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NGVD29

6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
-0.5
-1
-1.5
-2
-2.5
-3

WY2005 staff zero
= NGVD29 + 3.00 ft

6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3

7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2

The actual difference between NGVD29 and NAVD88 at any station can vary from 2.0 to 3.0 ft depending upon previous surveys and subsidence

WY 2005 Datum: Staff zero = NGVD29 + 3.00 ft

WY 2006 Datum: Staff zero = 0.00 ft NAVD88

*C = Difference between WY 2006 and WY 2005 = WY 2006 staff readings minus WY

2005 staff readings of water surface = NAVD88 - NGVD29 + 3.00 ft. The value of C can

be different from one station to the next due to subsidence differences between stations in

the Delta

To convert stage data from NAVD88 to NGVD29 + 3.00 ft, add C to NAVD88 stage value

To convert stage data from NGVD29 + 3.00 ft to NAVD88, subtract C from NGVD29 + 3.00 ft stage value

WS = Water surface

Figure 1